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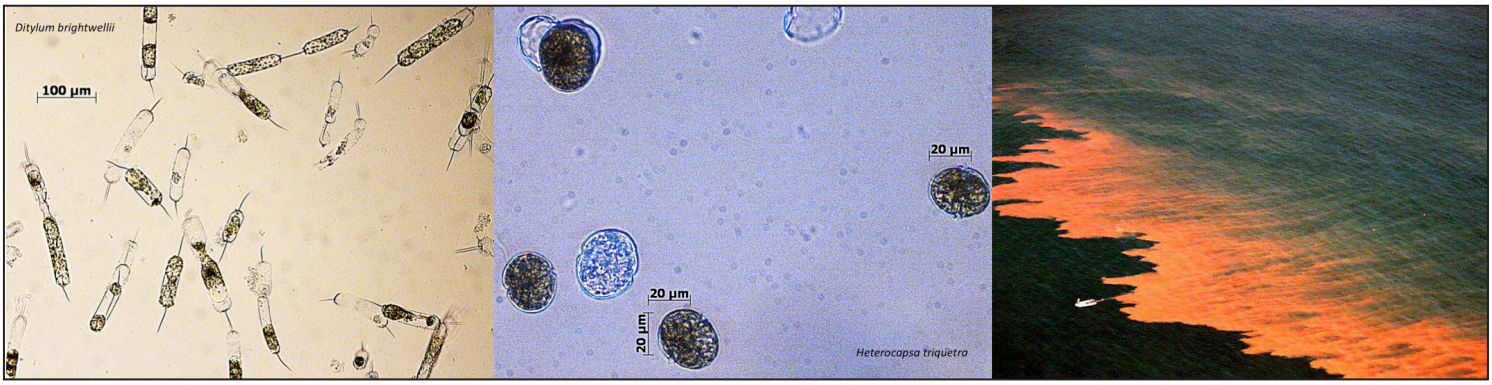
Discovery Porthole

Sharing Research with Educators and the Public

Phytoplankton and the Oil Spill

The Deepwater Horizon disaster exposed countless plants and animals to harmful crude oil. Though less visible, phytoplankton were also impacted. Scientists from Louisiana State University are investigating what effects the toxic components of crude oil may have on phytoplankton by studying two common species of the Gulf of Mexico.

Phytoplankton are free-floating microscopic algae. They play an important role in the marine food web as primary producers and in nutrient cycling. They are most visible when certain conditions lead to a population explosion resulting in what is known as a bloom. Some phytoplankton blooms are so large they are easily visible in satellite images. Two common groups of phytoplankton are the ***diatoms*** and ***dinoflagellates***. Diatoms occur in a variety of habitats, so long as they are damp with ample light and nutrients, including oceans, lakes, marshes and even moist soil and rocks. Dinoflagellates can also occur in large numbers as blooms. Some of these harmful algal blooms are responsible for "red tides", an event where the water is so dense with these organisms that the color of the water is altered. Red tides often result in fish kills. Some species even produce very potent toxins that can accumulate in fish and shellfish. When these animals are eaten by humans they can cause serious illness. While many are photosynthetic, some species of dinoflagellates make use of their flagella (tail) and actively consume diatoms and even other dinoflagellates.



L to R: Diatom Ditylum brightwelli, dinoflagellate Heterocapsa triquetra (Images/LSU) and a dramatic example of a red tide event (Image/NOAA).

Dr. Sibel Bargu Ates and her PhD student Koray Ozhan of LSU studied the diatom *Ditylum brightwelli* and dinoflagellate *Heterocapsa triquetra*. These are both commonly found in the coastal waters and estuaries of the northern Gulf of Mexico. The goal of their study was to examine how tolerant these two species are to ***benzo(a)-pyrene***, a highly toxic component of crude oil. Benzo(a)pyrene is a polycyclic aromatic hydrocarbon (PAH) known to cause cancer and genetic mutations. PAHs are found not only in crude oil, but also in many household products including mothballs and anti-dandruff shampoos, and are present in charbroiled foods and cigarette smoke. In this study, the dinoflagellates were more tolerant of exposure to benzo(a)pyrene than the diatoms. However, both the diatoms and dinoflagellates showed decreased growth and ultimately died at high exposure levels.

Dr. Bargu Ates interests in harmful algal blooms led her to a bizarre discovery. The diatom, *Pseudo-nitzchia*, which produces a powerful neurotoxin called Domoic acid, likely caused thousands of birds to become disoriented, flying erratically and ultimately dying, near Monterey Bay, California in 1961. This event partially inspired the famous scene from Alfred Hitchcock's classic film "The Birds".

Education Extension

Key Terms: *phytoplankton, water quality, eutrophication*

Classroom Activity: Phytoplankton

What is a phytoplankton bloom? Why do they happen? In this activity students will learn about phytoplankton, blooms, why they can be dangerous and how human activity may play a role in the frequency of blooms.

Supplies: *algal culture, clear containers, fertilizer, microscopes and slides*

Directions: 1) After learning about phytoplankton, students can experiment with creating a bloom of their own. Obtain algae, either from a classroom aquarium, nearby pond or from a commercial supplier. 2) Each student should have their own clear glass or plastic container of algae and water placed in a sunny window. 3) Students can add fertilizers of varying concentrations to test the effects. They may also choose to use individual nutrients as opposed to a mix. 4) Over the next 2 weeks, students should make observations of their algal cultures and examine them under a microscope to determine cell density and compare with other treatments.

Visit www.bigelow.org for additional phytoplankton lessons and activities.

Ocean Literacy Principles: 5. The ocean supports a great diversity of life and ecosystems, 6. The ocean and humans are inextricably interconnected

National Science Standards: A. Science as Inquiry: Abilities necessary to do scientific inquiry; C. Life Science: Populations and ecosystems; G. History and Nature of Science: Science as a human endeavor

Visit **http://dhp.disl.org/resources.html** for lesson plans and additional marine-related activities.

****Use the key terms above to search for additional lesson plans on the web!***

Did You Know...

Diatoms are one of the largest and most significant groups of organisms on Earth. They play a critical role in the marine food web, account for 20-25% of all organic carbon fixation on the planet and are a major source of atmospheric oxygen. The fossilized silica remains of diatoms form diatomaceous earth and is sold as insecticides, cat litter and dynamite components.

Dinoflagellates are also important both ecologically and economically. Some photosynthetic species have a mutualistic relationship with corals, anemones and jellyfish. The host provides protection within its tissues and nutrients needed for photosynthesis and the dinoflagellate "feeds" sugars back to the host.

Benzo(a)pyrene is a carcinogenic polycyclic aromatic hydrocarbon present in crude oil. PAHs are a product of incomplete combustion and can also come from forest fires, burning coal, and automobile exhaust. While all crude oil contains PAHs, the Louisiana light sweet crude that was spilled has been shown to contain fewer PAHs than heavy crude oil as well as fewer of the carcinogenic compounds like benzo(a)pyrene.

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